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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

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TITLE OF THE INVENTION (280 characters max)

TRICK MODE OPERATION FOR SUB-CHANNEL

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ENCLOSED APPLICATION PARTS (check all that apply)

Specification Number of Pages

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Drawing(s) Number of Sheets

Other (specify)

Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)

Applicant claims small entity status. See 37 CFR 1.27.

A check or money order is enclosed to cover the filing fees

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The Commissioner is hereby authorized to charge filing
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160

Payment by credit card. Form PTO-2038 is attached.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

No.

Yes, the name of the U.S. Government agency and the Government contract number are: _____

Respectfully submitted,
SIGNATURE

Date JULY 21, 2003

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REGISTRATION NO.
(if appropriate)

28,234

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TRICK MODE OPERATION FOR SUB-CHANNEL

Many IEEE-1394 based digital storage mediums, such as DVHS recorders and hard drives for PVR, are used for the capture and playback of MPEG transport streams, which may contain multiple video and audio programs.

Current technology does not allow for the implementation of trick mode operations (fast forward, rewind, etc) upon sub-channels (programs within this type of stream which are not the first or "primary" program).

This invention will allow a display device/decoder and IEEE-1394 based digital storage medium to perform trick mode operations (fast-forward, rewind, etc), on sub-channels within an MPEG transport stream.

The control of IEEE-1394 digital storage devices such as hard drive recorders for PVR, DVHS machines, is performed using a command set defined by the Audio/Video Control (AV/C) specifications released by the 1394 Trade Association. The common specification defines a set of commands for controlling audio/video devices by using IEEE 1394.

Within these specifications are controls to do such things as turn on/off devices, initiate a play, fast forward, rewind, etc. A major deficiency of this command set is the inability to perform trick mode operations such as fast forward or rewind when the user of the device is watching a sub-channel. This invention addresses and solves that problem.

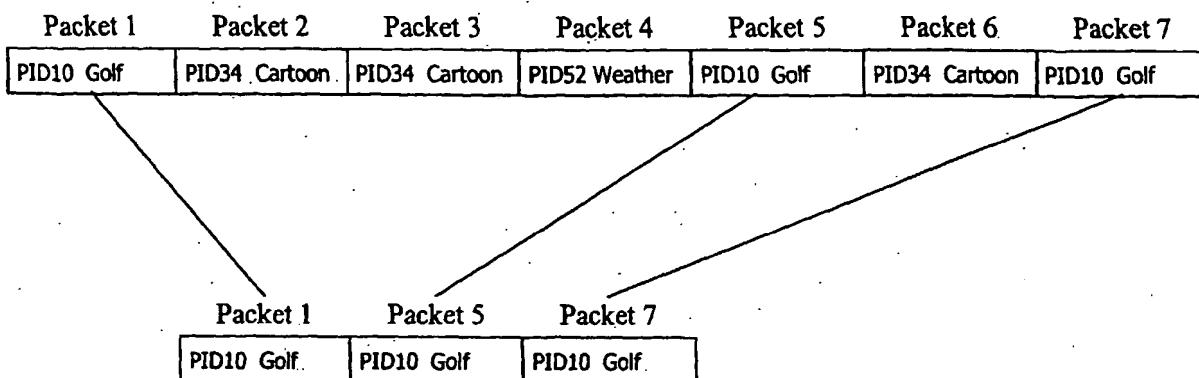
Currently there is no known solution to the problem. Currently available products do not perform sub-channel trick modes.

The following background technical information is required to understand the nature of the problem.

A common use for IEEE-1394 based digital storage devices is for the recording of digital broadcast audio and video, such as those carried by ATSC, DVB, and DBS systems. As an example, in the ATSC case digital audio and video are delivered via an MPEG-2 transport stream which is then captured to the 1394 device for storage and playback.

Most digital television transmissions contain multiple programs (often referred to as multi-casting). In these captured transport streams there are therefore packets of data from several different programs at once. The data necessary to extract one or another program from the transport stream is defined in the Program Specific Information (PSI). When the 1394 device is playing back the recorded transport stream to an ATSC compatible television receiver, the receiver uses the Program Specific Information to extract only the information that is required for the decoding and display of the program of interest to the user. The other programs on the stream are still delivered to the receiver from the 1394 device. This data is merely disregarded by the receiver.

For example, the 1394 device may hold a recording containing several video programs: "Golf", "Cartoons", "Weather". Each of these programs is delivered in packets that have unique Packet Identifiers (PIPs) as described in the PSI. The video for golf may be on PIP=10, the video for cartoons on PIP=34, and the video for weather on PIP=52. The data delivered might look as follows, when the user is watching golf:



Packets 1, 5, 7 are used to generate the video, the others are discarded. A large number of packets is required in order to reconstruct a single video frame.

When the user attempts to fast forward, an AV/C command is sent to the 1394 device to tell it to fast forward. Due to the limited bandwidth of the interfaces involved and the limited amount of memory available on the receiver, during FFWD only some frames are sent, many are skipped.

When the 1394 storage device receives the command to FFWD, it only knows that the user wishes to FFWD. It does not know which program the user is watching (the receiver filters out the video packets for the program that the user wishes to view, not the 1394 device). Therefore it must make an assumption about which program it will deliver frames from. For a generic MPEG stream, the first program listed in the Program Association Table is generally chosen. In general, some intra-coded frames, consisting of packets with the PIDs associated with the first program are then delivered. The receiver will receive all of the packets necessary to reconstruct the video for the primary program. However, since all of the packets for the different programs are multiplexed together as shown above, the receiver will also get interspersed snippets of the frames on the other PIDs. This is why FFWD, REW, etc are not possible on sub-channels with the current technology.

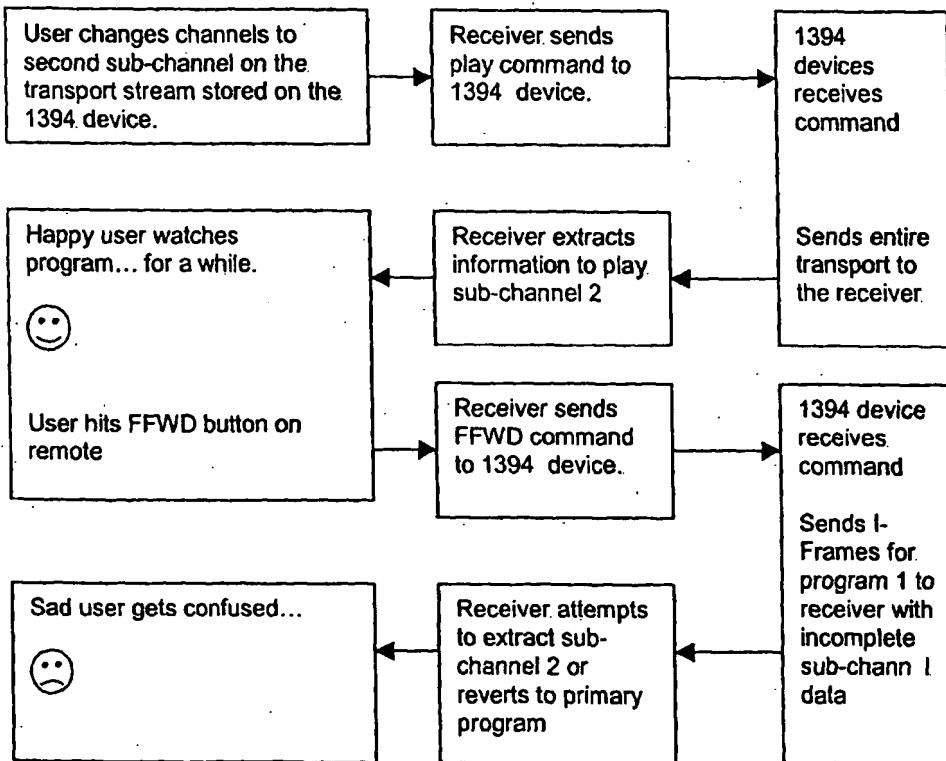
Under the conditions described here in which a user is watching a sub-channel and tries to use a trick mode, the current receivers will react in one of two ways:

1. The receiver will know that FFWD has commenced and will revert back to the primary program for the duration of the fast forward. In the example given, if the first program is golf and the user is watching cartoons from the same bitstream, when the user tries to fast forward, the video would switch to golf for the duration of the fast forward, and then revert back to cartoons when normal play is resumed.
2. The receiver sends the fast forward command to the 1394 device, and tries to continue playing the current stream. In the example given, if the first program is golf and the user is watching cartoons from the same bitstream, when the user tries to fast forward, the only bits and pieces of the data necessary to produce frames for cartoons will be delivered. The result from the receiver will be substantial undesirable MPEG video artifacts, or the receiver may actually interpret the stream as a weak signal and blank the screen.

The solution for this is to augment the command structure so that the receiver may indicate to the 1394 storage device which of the programs on the stream is of interest, and the 1394 device can interpret this augmented command to send the proper data during trick mode operation.

Note that the example of an ATSC MPEG-2 transport stream with three programs was used for illustrative purposes only. The invention described here can be applied to any multiplexed stream captured on a digital storage medium.

Current operation:



Operation with invention: